April 28, 1898.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

The following Papers were read:—

I. "On the Meteorological Observatories of the Azores." By H.S.H. PRINCE ALBERT I OF MONACO. Communicated by J. Y. BUCHANAN, F.R.S.

II. "A Compensated Interference Dilatometer." By A. E. TUTTON. Communicated by Professor CLIFTON, F.R.S.

III. "A Calorimeter for the Human Body." By WILLIAM MARCET, M.D., F.R.S.

IV. "An Experimental Enquiry into the Heat given out by the Human Body." By WILLIAM MARCET, M.D., F.R.S.

"On the Meteorological Observatories of the Azores." By H.S.H. THE PRINCE ALBERT I OF MONACO. Communicated by Mr. J. Y. BUCHANAN, F.R.S. Received April 19, —Read April 28, 1898.

(Translation.)

In 1892 I brought before the British Association, met in Edinburgh, a project which my scientific cruises in the North Atlantic had suggested and preliminary experiments have matured. The importance of meteorological observations is now universally recognised, and a continually increasing number of centres of observation are being created in order to assist the progress of this science.

I proposed to establish on the Azores an advanced post, whose mission should be: 1st, to observe the birth of certain atmospheric disturbances, which appear to be formed in this region of the Atlantic; 2nd, to correct the path of certain others which appear to threaten the coasts of Europe and which are announced from America at too great a distance of time and space for there to be an assurance that more or less considerable modifications may not take place which will affect their strength, their direction, and the date of their arrival on the European coasts.

We should then have, on a point situated almost in the middle of

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the Atlantic, an observatory, the work of which would also include the study of seismic phenomena, and this with great advantage, because, in certain circumstances, the earthquakes felt in Europe have, in the first instance, affected the volcanic *massif* of the Azores.

It is hardly necessary to say that those interested in the study of terrestrial magnetism will view with pleasure the opening of an observatory which is to render useful services in this department of science. Many countries will profit directly by the observations made on the Azores, because they interest all branches of the nautical profession as well as the populations of all the western coasts of Europe. The navigator approaching the end of a long voyage in a sailing vessel will here find the means of regulating his chronometers at the time when it is most wanted, namely, before making the continental land.

Since the first mention of my project in 1892, an event, which I awaited with much impatience, has arrived to help it, namely, the telegraphic connection of the Azores with Europe. Soon afterwards the Portuguese Government gave effect to my views by creating on the Island of St. Miguel, and under the direction of Captain Chaves, a regular meteorological station, although fitted with the most modest means.

Finally, last year Captain Chaves was commissioned to establish on the Island of Flores, the most westerly of the Azores, a second meteorological station, the observations at which will be most useful for supplementing those of San Miguel. Unfortunately, its means are even more modest than those of the preceding one, and the telegraph cable has not yet reached it.

In spite of the insufficient means of observation actually existing in the Azores, the results which they already furnish towards establishing the paths of the depressions which cross the Atlantic, enable a presentiment to be formed of the part which they will play when their outfit is more complete.

In order that science may the sooner profit by the advantages promised by the observatory of the Azores; and in order to guarantee it against all the dangers which might cause an interruption of its functions, I propose to give it a constitution founded on the principle of an international guarantee, which would be secured by the pecuniary contributions of the countries interested. It is principally to expose this idea that I have come to-day to speak of these observatories to the Royal Society.

Portugal, accepting the principle of the international *régime*, has commissioned Captain Chaves to invite the maritime nations interested to give their adhesion to my project and to associate themselves in the organisation of the above-mentioned meteorological service.

It may therefore be hoped that in the near future an understanding will be arrived at on the importance of the development to be given to the observatory of the Azores, and I ask the Royal Society, whose influence is so great in the domain of science, to support, by its concurrence, the accession of England to the ideas which I uphold for the common interest.

"A Compensated Interference Dilatometer." By A. E. TUTTON, Assoc. R.C.S. Communicated by Captain ABNEY, C.B., F.R.S. Received March 8,—Read April 28, 1898.

(Abstract.)

The author describes a form of Fizeau interference dilatometer which he considers combines the best features of the apparatus described by Benoit, and belonging to the Bureau International des Poids et Mesures, in Paris,* and that described by Pulfrich'† constructed according to the modifications introduced into the method by Abbe. Moreover, besides other improvements, a new principle, that of compensation for the expansion of the screws of the Fizeau tripod which supports the object, is introduced, which enhances the sensitiveness of the method so highly as to render it applicable to the determination of the expansion of crystals in general, including those of chemical preparations. Hitherto the application of the Fizeau method has been confined to such crystals as could be obtained large enough to furnish a homogeneous block at least a centimetre thick. A block only 5 mm. thick is ample for use with the author's compensated dilatometer. The principle of the compensation depends upon the fact that aluminium expands 2·6 times as much as platinum-iridium for the same increment of temperature. The author therefore employs, like Fizeau and Benoit, a tripod of platinum-iridium, and places upon its transverse table, through which pass the three screws, a disc of aluminium whose thickness is 1/2·6ths of the length of the screws. The space between the lower surface of the glass plate which is laid upon the upper ends of the screws to assist in producing the interference, and the upper surface of the aluminium, then remains constant for all temperatures under observation, and if a crystal is laid upon the aluminium compensator the whole amount of its expansion by rise of temperature is available for measurement by the interference method. Hence the method is no longer a merely relative one, affording the difference of expansion between the tripod and the substance investigated, but affords directly absolute measurements of the expansion.

* 'Trav. et Mémoires,' 1881, p. 1.

† 'Zeits. für Instrumen.,' 1893, p. 365.